Illinois Department of Transportation

To:	John Fortman	Attn: District One
From:	John D. Baranzelli	
Subject:	Pavement Design	
Date:	May 6, 2013	

IL Route 47
McHenry County
At O'Brien Road/Vanderkarr Road

We have reviewed the pavement design for the above captioned section, which was submitted to BDE on March 4, 2013. This project does not require alternate bidding. Life Cycle Cost Analysis favored a rigid pavement design for IL 47 at O'Brien Road/Vanderkarr Road as it is within 10%, and required the Pavement Selection Committee to convene. Minutes are attached to this memo.

The Pavement Selection Committee concurred with the design submitted by the district for the pavement. The approved pavement design is as follows:

IL 47at O'Brien Road/Vanderkarr Road [Reconstruction]

9 inches of PCC Pavement with Tied PCC Shoulders
4 inches Stabilized Subbase
12 inches Aggregate Subgrade Improvement

IL 47 at Thayer Road is pavement widening based on first cost analysis and favors the HMA mechanistic design. The pavement design is as follows:

IL 47at Thayer Road [Widening]

9.5 inches of Full-Depth HMA Pavement
- 1.5 inches HMA Surface Course, Mix "D", N70
- 1 inch Polymerized Leveling Binder Course (Machine Method), IL-4.75, N50
- 7 inches HMA Binder Course, IL-19.0, N70

12 inches Aggregate Subgrade Improvement

IL 47at Thayer Road [Resurfacing]

2.5 inches of Pavement Surface Removal
- 1.5 inches HMA Surface Course, Mix "D", N70
- 1 inch Polymerized Leveling Binder Course (Machine Method), IL-4.75, N50

If you have any questions, please contact Paul Niedernhofer at (217) 524-1651.

Pavement Selection Committee March 28, 2013

BDE chaired the Pavement Selection Committee for two pavement designs from District 1. The following personnel represented the committee:

Jenpai Chang	District 1
Melchor Mangoba	District 1
Tim Kell	Construction
LaDonna Rowden	BMPR
Paul Niedernhofer	BDE

IL 47 at O'Brien/Vanderkarr Road

This project will construct a roundabout at the intersection of O'Brien/Vanderkarr Road, and add northbound and southbound turn lanes at the intersection of Thayer Road. The project is not subject to the alternate bidding process because the project doesn't meet the 2 lane-mile length requirement. The LCCA for the intersection of O'Brien/Vanderkarr favored the rigid design over a flexible design by 6.6%. Because the difference is less than 10%, the BDE Manual stipulates that the pavement selection will be chosen by a vote of the Pavement Selection Committee. Ms. Rowden asked if the district had looked at any supplemental pavement designs. The district stated they had not done so.

This project will utilize paved shoulders and require a stabilized sub-base. The district proposed to use a 4.5 inch sub-base in lieu of the 4 inch policy thickness due to a projected cost savings. Documentation could not substantiate this savings.

On May 1, 2013, D-1 sent an email to the Pavement Selection Committee stating that the stabilized sub-base thickness will conform to the 4 inch standard thickness.

The committee favored the rigid design for the O'Brien/Vanderkarr intersection.

The widening of Thayer Road is dictated by first costs, and does not require action by the Pavement Selection Committee. The cost analysis favored a mechanistic flexible design.

Illinois Department of Transportation

Memorandum

To: John D. Baranzelli
Attn: Paul Niedernhofer

From: John Fortmann
By: Jose Dominguez/ Melchor Mangoba

Subject: Pavement Analysis*

Date: March 4, 2013

*Route: IL 47
Limits: At O'Brien/Van Derka
Letting: 06CY14

Job No.: P-91-146-12
County: McHenry
Contract No.:13370

We have completed the pavement analysis for the above captioned location. Review by the Central Office is required since the total pavement area for reconstruction and widening exceeds 4,750 Square Yards. The following is the scope of the project:

a. Reconstruction of a roundabout at the intersection of IL 47 at O'Brien Rd/ Vanderkarr Rd.

b. Widening and resurfacing of approximately 1,373 feet of IL 47 to accommodate northbound and southbound left turn lanes at the intersection of Thayer Rd.

A 20-year pavement analysis was performed on above segments. The life cycle cost analysis does not favor either pavement by more than 10%. However, since the scope of work of the project is "less than 2 lane-miles in length" an alternate bid does not need to be considered according to section 1.04a of Chapter 54 of the BDE manual. Thus, a mechanistic-rigid pavement design is recommended since the life cycle cost analysis does favor PCC. The recommended pavement is:

a. IL 47 at O'Brien/Vanderkarr Rd [8]
PCC Shoulders (Tied)
Proposed Reconstruction
9" PCC Pavement [1]
4 ½" Stabilized Subbase [2]
12" Aggregate Subgrade Improvement [6]

A 20-year pavement analysis was performed on the intersection of IL 47 at Thayer Rd. Our recommendation for the segment is as follows based on the mechanistic pavement design procedure using a first cost analysis.

b. IL 47 at Thayer Rd
Proposed Pavement Widening
9 ½" Full Depth HMA Pavement [7]
1 ½" HMA Surface Course, Mix "D", N70 [3]
1" Polymerized Leveling Binder (Machine Method), IL-4.75, N50 [4]
7" Binder Course, IL 19.0, N70 [5]
12" Aggregate Subgrade Improvement [6]

Existing Pavement Resurfacing
2 ½" HMA Pavement Surface Removal
1 ½" HMA Surface Course, Mix "D", N70 [3]
1" Polymerized Leveling Binder (Machine Method), IL-4.75, N50 [4]

[1] Designer Note: Use pay item **#42000401, "PORTLAND CEMENT CONCRETE PAVEMENT, 9" (JOINTED)"**, paid in square yards.

[2] Designer Note: Use pay item **#31200502, "STABILIZED SUBBASE - HOT-MIX ASPHALT, 4 1/2" "**, paid in square yards

[3] Designer Note: Use pay item **#40603340, "HOT-MIX ASPHALT SURFACE COURSE, MIX "D", N70"**, paid in ton.

[4] Designer Note: Use pay item **#40600827, "POLYMERIZED LEVELING BINDER (MACHINE METHOD), IL-4.75, N50"**, paid in ton.

[5] Designer Note: For widening of six feet or less use pay item **#35600704, "HOT-MIX ASPHALT BASE COURSE WIDENING, 7" "**, paid for in square yards. For widening of greater than six feet use pay item **#35501312, "Hot-Mix Asphalt Base Course, 7" "**, paid for in square yards.

[6] Designer Note: Use pay item **#30300112, "AGGREGATE SUBGRADE IMPROVEMENT, 12" "**, paid in square yards.

[7] Designer Note: Refer to the District One, Bureau of Materials' "Hot-Mix Asphalt – Mix Selection" tables to determine the corresponding HMA mix table requirements for the plans.

[8] Designer Note: O'Brien Rd/Vanderkarr Rd is subject to local jurisdictional approval and concurrence.

If you have any questions or need additional information, please contact Jenpai Chang, Interim Pavement Engineer, at (847) 705-4432

By: José A. Dominguez
Jose A. Dominguez, P.E.
Project Support Engineer

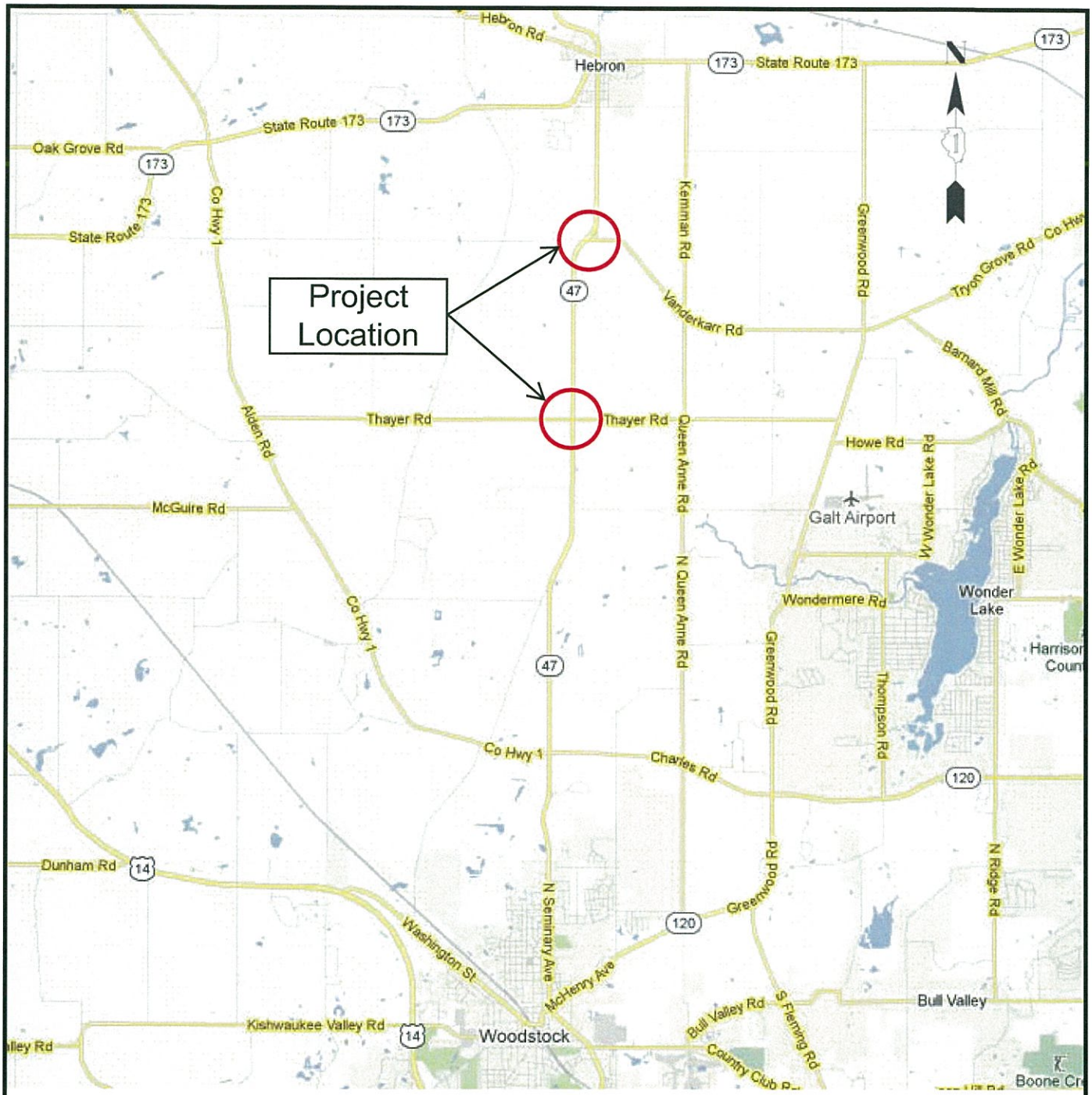

Exhibit 1

Location Map

IL Route 47, McHenry County

Hampton, Lenzini and Renwick, Inc.

Civil & Structural Engineers . Land Surveyors . Environmental Services

ELGIN . SPRINGFIELD . ROMEOVILLE

www.hlrengineering.com

184.000959 ILLINOIS PROFESSIONAL DESIGN FIRM LS / PE / SE CORPORATION

BDE 5401 Template (Rev. 10/05/2012)

IDOT MECHANISTIC PAVEMENT DESIGN

Printed: 11/07/2013

PROJECT AND TRAFFIC INPUTS

(Enter Data in Gray Shaded Cells)

Route: IL 47
Section:
County: McHenry
Location: O'Brien Road
Comments:
Design Date: 02/11/2013 AS <-- BY
Modify Date: <-- BY

	ADT	Year
Current:	5,400	2009
Future:	8,000	2040

Facility Type: Other Marked State Route
# of Lanes = 2 or 3
Part of future 4 lanes or more ? No
One Way Street ? No
Road Class: II

Subgrade Support Rating (SSR): Poor
Construction Year: 2013
Design Period (DP) = 20 years

	Structural Design Traffic			
	Minimum ADT	Actual ADT	Actual %of Total ADT	% of ADT in Design Lane
PV =	0	5,884	89.5%	P = 50%
SU =	250	329	5.0%	S = 50%
MU =	750	362	5.5%	M = 50%
		Struct. Design ADT =	6,574	(2023)

TRAFFIC FACTOR CALCULATION

FLEXIBLE PAVEMENT			RIGID PAVEMENT		
Cpv =	0.15		Cpv =	0.15	
Csu =	112.06		Csu =	135.78	
Cmu =	385.44		Cmu =	567.21	
TF flexible (Actual) =	1.77	(Actual ADT)	TF rigid (Actual) =	2.51	(Actual ADT)
TF flexible (Min) =	3.17	(Min ADT Fig. 54-2.C)	TF rigid (Min) =	4.59	(Min ADT Fig. 54-2.C)

NEW CONSTRUCTION / RECONSTRUCTION PAVEMENT DESIGN CALCULATIONS

Full-Depth HMA Pavement

Use TF flexible = 3.17
PG Grade Lower Binder Lifts = PG 64-22 (Fig. 53-4.R)
Goto Map
HMA Mixture Temp. = 73.0 deg. F (Fig. 54-5.C)
Design HMA Mixture Modulus (E_{HMA}) = 760 ksi (Fig. 54-5.D)
Design HMA Strain (ε_{HMA}) = 86 (Fig. 54-5.E)
Goto Map
Full Depth HMA Design Thickness = 9.50 in. (Fig. 54-5.F)
Limiting Strain Criterion Thickness = 14.25 in. (Fig. 54-5.I)

Use Full-Depth HMA Thickness = 9.50 inches

JPC Pavement

Use TF rigid = 4.59
Edge Support = Tied Shoulder or C.&G.

Rigid Pavt Thick. = 9.00 in. (Fig. 54-4.E)

CRC Pavement

Use TF rigid = 4.59
IBR value = 2

CRCP Thickness = 8.00 in. (Fig. 54-4.N)

TF MUST BE > 60 FOR CRCP

RECONSTRUCTION ONLY (SUPPLEMENTAL) PAVEMENT DESIGN CALCULATIONS

HMA Overlay of Rubblized PCC

Use TF flexible = 3.17
District = 3,4,5,6

HMA Overlay Design Thickness = 8.00 in. (Fig. 54-5.U)

Unbonded Concrete Overlay

Review 54-4.03 for limitations and special considerations.

JPCP Thickness = NA inches

CONTACT BMPR FOR ASSISTANCE

DESIGN TABLES FROM BDE MANUAL CHAPTER 54 - PAVEMENT DESIGN

Class I Roads	Class II Roads	Class III Roads	Class IV Roads
4 lanes or more Part of a future 4 lanes or more One-way Streets with ADT > 3500	2 lanes with ADT > 2000 One way Street with ADT <= 3500	2 Lanes (ADT 750 -2000)	2 Lanes (ADT < 750)

	Min. Str. Design Traffic (Fig 54-2.C)		
Facility Type	PV	SU	MU
Interstate or Supplemental Freeway	0	500	1500
Other Marked State Route	0	250	750
Unmarked State Route	No Min	No Min	No Min

Class Table for One-Way Streets	
ADT	Class
0 - 3500	II
>3501	I

	Traffic Factor ESAL Coefficients			
	Rigid (Fig. 54-4.C)		Flexible (Fig. 54-5.B)	
Class	Csu	Cmu	Csu	Cmu
I	143.81	696.42	132.50	482.53
II	135.78	567.21	112.06	385.44
III	129.58	562.47	109.14	384.35
IV	129.58	562.47	109.14	384.35

Class Table for 2 or 3 lanes (not future 4 lane & not one-way street)	
ADT	Class
0 - 749	IV
750 - 2000	III
>2000	II

	Design Lane Distribution Factors For Structural Design Traffic (Fig. 54-2.B)					
	Rural			Urban		
Number of Lanes	P	S	M	P	S	M
1 Lane Ramp	100%	100%	100%	100%	100%	100%
2 or 3	50%	50%	50%	50%	50%	50%
4	32%	45%	45%	32%	45%	45%
6 or more	20%	40%	40%	8%	37%	37%

BDE 5401 Template (Rev. 10/05/2012) Printed: 11/07/2013

LIFE-CYCLE COST ANALYSIS: NEW CONSTRUCTION / RECONSTRUCTION

FULL-DEPTH HMA PAVEMENT

Standard Design

ROUTE			IL 47
SECTION			
COUNTY			McHenry
LOCATION			O'Brien Road
FACILITY TYPE			NON-INTERSTATE
PROJECT LENGTH			2677 FT ==> 0.51 Miles
# OF CENTERLINES			1 CL
# OF LANES			2 LANES
# OF EDGES			2 EP
LANE WIDTH - AVERAGE			12 FT
SHOULDER WIDTH	HMA	Inside	10 FT
	HMA	Outside	10 FT

PAVEMENT THICKNESS (FLEXIBLE)	9.50 IN	14.25 IN MAX
SHOULDER THICKNESS	8.00 IN	Standard Design
POLICY OVERLAY THICKNESS	2.25 IN	

FLEX PAVEMENT TRAFFIC FACTORS	MINIMUM	ACTUAL	USE
	3.17	1.77	3.17

Read Me!

HMA COST PER TON	UNIT PRICE
HMA SURFACE	$95.00 / TON
HMA TOP BINDER	$90.00 / TON
HMA LOWER BINDER	$85.00 / TON
HMA BINDER (LEVELING)	$95.00 / TON
HMA SHOULDER	$85.00 / TON

INITIAL COSTS

ITEM	THICKNESS	100% QUANTITY	UNIT		UNIT PRICE	COST
HMA PAVEMENT (FULL-DEPTH)	(9.50")	7,139	SQ YD	*	$36.36 / SQ YD	$259,562 ~
HMA SURFACE COURSE	(2.00")	7,139	SQ YD		$10.71 / SQ YD	$0
HMA TOP BINDER COURSE	(2.25")	7,139	SQ YD		$11.59 / SQ YD	$0
HMA LOWER BINDER COURSE	(5.25")	7,139	SQ YD		$26.18 / SQ YD	$0
HMA SHOULDER	(8.00")	5,949	SQ YD	*	$41.73 / SQ YD	$248,247 ~
CURB & GUTTER		0	LIN FT		$30.00 / LIN FT	$0
SUBBASE GRAN MATL TY C (TONS)		0	TONS		$25.00 / TON	$0
IMPROVED SUBGRADE:	Aggregate	5,333	SQ YD	*	$10.00 / SQ YD	$53,330
Reserved For User Supplied Item		0	UNITS		$0.00 / UNITS	$0
Reserved For User Supplied Item		0	UNITS		$0.00 / UNITS	$0
PAVEMENT REMOVAL		7,139	SQ YD		$0.00 / SQ YD	$0
SHOULDER REMOVAL		5,949	SQ YD		$0.00 / SQ YD	$0

Note: * Denotes User Supplied Quantity

FLEXIBLE CONSTRUCTION INITIAL COST	$561,139
FLEXIBLE CONSTRUCTION ANNUAL COST PER MILE	$45,140

MAINTENANCE COSTS:

ITEM	THICKNESS	MATERIAL	UNIT COST
ROUTINE MAINTENANCE ACTIVITY			$0.00 LANE-MILE / YEAR
HMA OVERLAY PVMT SURF	(2.00")	Surface Mix	$10.00 / SQ YD
HMA OVERLAY PVMT	(2.25")		$11.25 / SQ YD
HMA SURFACE MIX	(1.50")	Surface Mix	$7.50 / SQ YD
HMA BINDER MIX	(0.75")	eling Binder Mix	$3.75 / SQ YD
HMA OVERLAY SHLD (Year 30)	(2.25")	Shoulder Mix	$11.25 / SQ YD
HMA OVERLAY SHLD	(2.00")	Shoulder Mix	$10.00 / SQ YD
MILLING (2.00 IN)			$2.50 / SQ YD
PARTIAL DEPTH PVMT PATCH	(Mill & Fill Surf)	Surface Mix	$90.83 / SQ YD
PARTIAL DEPTH SHLD PATCH	(Mill & Fill Surf)	Shoulder Mix	$89.71 / SQ YD
PARTIAL DEPTH PVMT PATCH	(Mill & Fill +2.00 ")	Leveling Binder Mix	$90.83 / SQ YD
PARTIAL DEPTH SHLD PATCH	(Mill & Fill +2.00 ")	Shoulder Mix	$89.71 / SQ YD
LONGITUDINAL SHOULDER JOINT ROUT & SEAL			$2.00 / LIN FT
CENTERLINE JOINT ROUT & SEAL			$2.00 / LIN FT
RANDOM / THERMAL CRACK ROUT & SEAL	(100% Rehab = 110.00' / Station / Lane)		$2.00 / LIN FT

FLEXIBLE TOTAL LIFE-CYCLE COST	$830,519
FLEXIBLE TOTAL ANNUAL COST PER MILE	$66,809

HMA_SD

MAINTENANCE AND REHABILITATION ACTIVITY SCHEDULE 11/07/13

FULL-DEPTH HMA PAVEMENT
HMA OVERLAY OF RUBBLIZED PCC PAVEMENT
Figure 54-7.C
STANDARD DESIGN

MAINTENANCE COSTS:	ITEM	%	QUANTITY	UNIT	UNIT COST	COST	PRESENT WORTH
YEAR 5							
	LONG SHLD JT R&S	100.00%	5,354	LIN FT	$2.00	$10,708	
	CNTR LINE JOINT R&S	100.00%	2,677	LIN FT	$2.00	$5,354	
	RNDM / THRM CRACK R&S	50.00%	2,945	LIN FT	$2.00	$5,890	
	PD PVMT PATCH M&F SURF	0.10%	7	SQ YD	$90.83	$636	
	PWFn =	0.8626		PW =	0.8626 X	$22,588	$19,485
YEAR 10							
	LONG SHLD JT R&S	100.00%	5,354	LIN FT	$2.00	$10,708	
	CNTR LINE JOINT R&S	100.00%	2,677	LIN FT	$2.00	$5,354	
	RNDM / THRM CRACK R&S	50.00%	2,945	LIN FT	$2.00	$5,890	
	PD PVMT PATCH M&F SURF	0.50%	36	SQ YD	$90.83	$3,270	
	PWFn =	0.7441		PW =	0.7441 X	$25,222	$18,768
YEAR 15							
	MILL PVMT & SHLD 2.00"	100.00%	13,088	SQ YD	$2.50	$32,720	
	PD PVMT PATCH M&F ADD'L 2.00"	1.00%	71	SQ YD	$90.83	$6,449	
	HMA OVERLAY PVMT 2.00"	100.00%	7,139	SQ YD	$10.00	$71,387	
	HMA OVERLAY SHLD 2.00 "	100.00%	5,949	SQ YD	$10.00	$59,489	
	PWFn =	0.6419		PW =	0.6419 X	$170,045	$109,145
YEAR 20							
	LONG SHLD JT R&S	100.00%	5,354	LIN FT	$2.00	$10,708	
	CNTR LINE JOINT R&S	100.00%	2,677	LIN FT	$2.00	$5,354	
	RNDM / THRM CRACK R&S	50.00%	2,945	LIN FT	$2.00	$5,890	
	PD PVMT PATCH M&F SURF	0.10%	7	SQ YD	$90.83	$636	
	PWFn =	0.5537		PW =	0.5537 X	$22,588	$12,506
YEAR 25							
	LONG SHLD JT R&S	100.00%	5,354	LIN FT	$2.00	$10,708	
	CNTR LINE JOINT R&S	100.00%	2,677	LIN FT	$2.00	$5,354	
	RNDM / THRM CRACK R&S	50.00%	2,945	LIN FT	$2.00	$5,890	
	PD PVMT PATCH M&F SURF	0.50%	36	SQ YD	$90.83	$3,270	
	PWFn =	0.4776		PW =	0.4776 X	$25,222	$12,046
HMA_SD							
YEAR 30	NON-INTERSTATE						
	MILL PVMT & SHLD 2.00"	100.00%	13,088	SQ YD	$2.50	$32,720	
	PD PVMT PATCH M&F ADD'L 2.00"	2.00%	143	SQ YD	$90.83	$12,989	
	PD SHLD PATCH M&F ADD'L 2.00"	1.00%	59	SQ YD	$89.71	$5,293	
	HMA OVERLAY PVMT 2.25 "	100.00%	7,139	SQ YD	$11.25	$80,310	
	HMA OVERLAY SHLD 2.25 "	100.00%	5,949	SQ YD	$11.25	$66,925	
	PWFn =	0.4120		PW =	0.4120 X	$198,237	$81,671
YEAR 35							
	LONG SHLD JT R&S	100.00%	5,354	LIN FT	$2.00	$10,708	
	CNTR LINE JOINT R&S	100.00%	2,677	LIN FT	$2.00	$5,354	
	RNDM / THRM CRACK R&S	50.00%	2,945	LIN FT	$2.00	$5,890	
	PD PVMT PATCH M&F SURF	0.10%	7	SQ YD	$90.83	$636	
	PWFn =	0.3554		PW =	0.3554 X	$22,588	$8,027
YEAR 40							
	LONG SHLD JT R&S	100.00%	5,354	LIN FT	$2.00	$10,708	
	CNTR LINE JOINT R&S	100.00%	2,677	LIN FT	$2.00	$5,354	
	RNDM / THRM CRACK R&S	50.00%	2,945	LIN FT	$2.00	$5,890	
	PD PVMT PATCH M&F SURF	0.50%	36	SQ YD	$90.83	$3,270	
	PWFn =	0.3066		PW =	0.3066 X	$25,222	$7,732
							$269,380
	ROUTINE MAINTENANCE ACTIVITY		1.01	Lane Miles	0.00	$0	$0
					MAINTENANCE LIFE-CYCLE COST		$269,380
45	YEAR LIFE CYCLE	CRFn = 0.0407852			MAINTENANCE ANNUAL COST PER MILE		$21,670

PCC PAVEMENT

JPCP

ROUTE			IL 47	
SECTION			0	
COUNTY			McHenry	
LOCATION			O'Brien Road	
FACILITY TYPE			NON-INTERSTATE	
PROJECT LENGTH			2677 FT	= = > 0.51 Miles
# OF CENTERLINES			1 CL	
# OF LANES			2 LANES	
# OF EDGES			2 EP	
LANE WIDTH - AVERAGE			12 FT	
SHOULDER WIDTH	PCC	Inside	10 FT	
	PCC	Outside	10 FT	

PAVEMENT THICKNESS (RIGID)	JPCP	9.00 IN	TIED SHLD
SHOULDER THICKNESS		9.00 IN	
POLICY OVERLAY THICKNESS		2.50 IN	

RIGID PAVEMENT TRAFFIC FACTORS		MINIMUM	ACTUAL	USE
		4.59	2.51	4.59
Worksheet Construction Type is	Reconstruction		The Pavement Type is	JPCP

INITIAL COSTS

ITEM	THICKNESS	100% QUANTITY	UNIT		UNIT PRICE		COST
JPC PAVEMENT	(9.00")	7,139	SQ YD		$37.09	/ SQ YD	$264,786
PAVEMENT REINFORCEMENT		0	SQ YD		$0.00	/ SQ YD	$0
STABILIZED SUBBASE	(4.50")	8,031	SQ YD		$15.00	/ SQ YD	$120,465
PCC SHOULDERS	(9.00" to 9.00")	5,949	SQ YD		$32.09	/ SQ YD	$190,903
CURB & GUTTER		0	LIN FT		$30.00	/ LIN FT	$0
SUBBASE GRAN MATL TY C	(~ 2.06")	0	TONS	*	$25.00	/ TON	$0
IMPROVED SUBGRADE:	Aggregate	5,333	SQ YD	*	$10.00	/ SQ YD	$53,330
Reserved For User Supplied Item		0	UNITS		$0.00	/ UNITS	$0
Reserved For User Supplied Item		0	UNITS		$0.00	/ UNITS	$0
PAVEMENT REMOVAL		7,139	SQ YD		$0.00	/ SQ YD	$0
SHOULDER REMOVAL		5,949	SQ YD		$0.00	/ SQ YD	$0

Note: * Denotes User Supplied Quantity

RIGID CONSTRUCTION INITIAL COST	$629,484
RIGID CONSTRUCTION ANNUAL COST PER MILE	$50,638

MAINTENANCE COSTS:

ITEM	THICKNESS	MATERIAL	UNIT COST	
ROUTINE MAINTENANCE ACTIVITY			$0.00	/ LANE-MILE / YEAR
HMA POLICY OVERLAY	(2.50")			
HMA POLICY OVERLAY PVMT	(2.50")		$12.50	/ SQ YD
HMA SURFACE MIX	(1.50")	Surface Mix	$7.50	/ SQ YD
HMA BINDER MIX	(1.00")	Leveling Binder Mix	$5.00	/ SQ YD
HMA POLICY OVERLAY SHLD	(2.50")	Shoulder Mix	$12.50	/ SQ YD
CLASS A PAVEMENT PATCHING			$170.00	/ SQ YD
CLASS B PAVEMENT PATCHING			$130.00	/ SQ YD
CLASS C SHOULDER PATCHING			$110.00	/ SQ YD
PARTIAL DEPTH PVMT PATCH (Mill & Fill HMA Surf)		Surface Mix	$88.17	/ SQ YD
PARTIAL DEPTH PVMT PATCH (Mill & Fill HMA 2.50")		Surface Mix	$93.49	/ SQ YD
LONGITUDINAL SHOULDER JOINT ROUT & SEAL			$2.00	/ LIN FT
CENTERLINE JOINT ROUT & SEAL			$2.00	/ LIN FT
REFLECTIVE TRANSVERSE CRACK ROUT & SEAL			$2.00	/ LIN FT
RANDOM CRACK ROUT & SEAL	(100% Rehab = 100.00' / Station / Lane)		$2.00	/ LIN FT

RIGID TOTAL LIFE-CYCLE COST	$775,140
RIGID TOTAL ANNUAL COST PER MILE	$62,355

MAINTENANCE AND REHABILITATION ACTIVITY SCHEDULE 11/07/13

JOINTED PLAIN CONCRETE PAVEMENT
UNBONDED JOINTED PLAIN CONCRETE OVERLAY
Figure 54-7.A

MAINTENANCE COSTS:	ITEM	%	QUANTITY	UNIT	UNIT COST		COST	PRESENT WORTH
YEAR 10								
	PAVEMENT PATCH CLASS B	0.10%	7	SQ YD	$130.00		$910	
	PWFn =	0.7441		PW =	0.7441	X	$910	$677
YEAR 15								
	PAVEMENT PATCH CLASS B	0.20%	14	SQ YD	$130.00		$1,820	
	PWFn =	0.6419		PW =	0.6419	X	$1,820	$1,168
YEAR 20								
	PAVEMENT PATCH CLASS B	2.00%	143	SQ YD	$130.00		$18,590	
	SHOULDER PATCH CLASS C	0.50%	30	SQ YD	$110.00		$3,300	
	LONGITUDINAL SHLD JT R&S	100.00%	5,354	LIN FT	$2.00		$10,708	
	CENTERLINE JT R&S	100.00%	2,677	LIN FT	$2.00		$5,354	
	PWFn =	0.5537		PW =	0.5537	X	$37,952	$21,013
YEAR 25								
	PAVEMENT PATCH CLASS B	3.00%	214	SQ YD	$130.00		$27,820	
	SHOULDER PATCH CLASS C	1.00%	59	SQ YD	$110.00		$6,490	
	PWFn =	0.4776		PW =	0.4776	X	$34,310	$16,387
YEAR 30	NON-INTERSTATE							
	PAVEMENT PATCH CLASS B	4.00%	286	SQ YD	$130.00		$37,180	
	SHOULDER PATCH CLASS C	1.50%	89	SQ YD	$110.00		$9,790	
	HMA POLICY OVERLAY 2.5" (PVMT)	100.00%	7,139	SQ YD	$12.50		$89,233	
	HMA POLICY OVERLAY 2.5" (SHLD)	100.00%	5,949	SQ YD	$12.50		$74,361	
	PWFn =	0.4120		PW =	0.4120	X	$210,564	$86,750
YEAR 35	NON-INTERSTATE							
	LONGITUDINAL SHLD JT R&S	100.00%	5,354	LIN FT	$2.00		$10,708	
	CENTERLINE JT R&S	100.00%	2,677	LIN FT	$2.00		$5,354	
	RANDOM CRACK R&S	50.00%	2,677	LIN FT	$2.00		$5,354	
	REFLECTIVE TRANSVERSE CRACK R&S	40.00%	1,709	LIN FT	$2.00		$3,418	
	PD PVMT PATCH M&F HMA 2.50"	0.10%	7	SQ YD	$93.49		$654	
	PWFn =	0.3554		PW =	0.3554	X	$25,488	$9,058
YEAR 40	NON-INTERSTATE							
	PAVEMENT PATCH CLASS B	0.50%	36	SQ YD	$130.00		$4,680	
	LONGITUDINAL SHLD JT R&S	100.00%	5,354	LIN FT	$2.00		$10,708	
	CENTERLINE JT R&S	100.00%	2,677	LIN FT	$2.00		$5,354	
	REFLECTIVE TRANSVERSE CRACK R&S	60.00%	2,563	LIN FT	$2.00		$5,126	
	RANDOM CRACK R&S	50.00%	2,677	LIN FT	$2.00		$5,354	
	PD PVMT PATCH M&F HMA 2.50"	0.50%	36	SQ YD	$93.49		$3,366	
	PWFn =	0.3066		PW =	0.3066	X	$34,588	$10,603
								$145,656
	ROUTINE MAINTENANCE ACTIVITY		1.01	Lane Miles	$0.00		$0	$0
					MAINTENANCE LIFE-CYCLE COST			$145,656
45	YEAR LIFE CYCLE	CRFn = 0.0407852			MAINTENANCE ANNUAL COST PER MILE			$11,717

LIFE-CYCLE COST ANALYSIS: NEW DESIGN

Calculated / Revised : 2/11/13 1:00 PM

			JPCP	HMA
CONSTRUCTION	INITIAL COST	PRESENT WORTH	$629,484	$561,139
		ANNUAL COST PER MILE	$50,638	$45,140
MAINTENANCE	LIFE-CYCLE COST	PRESENT WORTH	$145,656	$269,380
		ANNUAL COST PER MILE	$11,717	$21,670
TOTAL	LIFE-CYCLE COST	PRESENT WORTH	$775,140	$830,519
		ANNUAL COST PER MILE	$62,355	$66,809

LIFE-CYCLE COST ANALYSIS: FINAL SUMMARY

LOWEST COST OPTION	==========>	**JPCP**	**$62,355**	
OTHER OPTIONS (LOWEST TO HIGHEST):	TYPE / PERCENTAGE	**HMA**	**$66,809**	7.1%

P:\Pavement Design Stuff\D-1\IL 47 at O'Brien & Thayer Roads\[IL 47 At O'Brien Rd IDOT Mechanistic Pavement Design with LCCA_10-11-12.xlsm]LifeCycleCost

BDE 5401 Template (Rev. 10/05/2012)

IDOT MECHANISTIC PAVEMENT DESIGN

Printed: 11/07/2013

PROJECT AND TRAFFIC INPUTS

(Enter Data in Gray Shaded Cells)

Route:	IL 47	Comments:			
Section:					
County:	McHenry	Design Date:	02/11/2013	AS	<-- BY
Location:	At Thayer Rd	Modify Date:			<-- BY

	ADT	Year
Current:	4,350	2009
Future:	5,400	2040

Facility Type: Other Marked State Route

# of Lanes =	2 or 3
Part of future 4 lanes or more ?	No
One Way Street ?	No
Road Class:	II
Subgrade Support Rating (SSR):	Poor
Construction Year:	2013
Design Period (DP) =	20 years

Structural Design Traffic	Minimum ADT	Actual ADT	Actual %of Total ADT	% of ADT in Design Lane
PV =	0	4,245	88.0%	P = 50%
SU =	250	193	4.0%	S = 50%
MU =	750	386	8.0%	M = 50%
Struct. Design ADT =		4,824	(2023)	

TRAFFIC FACTOR CALCULATION

FLEXIBLE PAVEMENT			RIGID PAVEMENT		
Cpv =	0.15		Cpv =	0.15	
Csu =	112.06		Csu =	135.78	
Cmu =	385.44		Cmu =	567.21	
TF flexible (Actual) =	1.71	(Actual ADT)	TF rigid (Actual) =	2.46	(Actual ADT)
TF flexible (Min) =	3.17	(Min ADT Fig. 54-2.C)	TF rigid (Min) =	4.59	(Min ADT Fig. 54-2.C)

NEW CONSTRUCTION / RECONSTRUCTION PAVEMENT DESIGN CALCULATIONS

Full-Depth HMA Pavement

Use TF flexible =	3.17	
PG Grade Lower Binder Lifts =	PG 64-22	(Fig. 53-4.R)
Goto Map — HMA Mixture Temp. =	73.0	deg. F (Fig. 54-5.C)
Design HMA Mixture Modulus (E_{HMA}) =	760	ksi (Fig. 54-5.D)
Design HMA Strain (ε_{HMA}) =	86	(Fig. 54-5.E)
Goto Map — Full Depth HMA Design Thickness =	9.50	in. (Fig. 54-5.F)
Limiting Strain Criterion Thickness =	14.25	in. (Fig. 54-5.I)
Use Full-Depth HMA Thickness =	**9.50**	**inches**

JPC Pavement

Use TF rigid =	4.59	
Edge Support =	Tied	Shoulder or C.&G.
Rigid Pavt Thick. =	**9.00**	**in. (Fig. 54-4.E)**

CRC Pavement

Use TF rigid =	4.59	
IBR value =	2	
CRCP Thickness =	**8.00**	**in. (Fig. 54-4.N)**

TF MUST BE > 60 FOR CRCP

RECONSTRUCTION ONLY (SUPPLEMENTAL) PAVEMENT DESIGN CALCULATIONS

HMA Overlay of Rubblized PCC

Use TF flexible =	3.17	
District =	3,4,5,6	
HMA Overlay Design Thickness =	**8.00**	**in. (Fig. 54-5.U)**

Unbonded Concrete Overlay

Review 54-4.03 for limitations and special considerations.

JPCP Thickness =	**NA**	**inches**

CONTACT BMPR FOR ASSISTANCE

DESIGN TABLES FROM BDE MANUAL CHAPTER 54 - PAVEMENT DESIGN

Class I Roads	Class II Roads	Class III Roads	Class IV Roads
4 lanes or more Part of a future 4 lanes or more One-way Streets with ADT > 3500	2 lanes with ADT > 2000 One way Street with ADT <= 3500	2 Lanes (ADT 750 -2000)	2 Lanes (ADT < 750)

	Min. Str. Design Traffic (Fig 54-2.C)		
Facility Type	PV	SU	MU
Interstate or Supplemental Freeway	0	500	1500
Other Marked State Route	0	250	750
Unmarked State Route	No Min	No Min	No Min

Class Table for One-Way Streets	
ADT	Class
0 - 3500	II
>3501	I

	Traffic Factor ESAL Coefficients			
	Rigid (Fig. 54-4.C)		Flexible (Fig. 54-5.B)	
Class	Csu	Cmu	Csu	Cmu
I	143.81	696.42	132.50	482.53
II	135.78	567.21	112.06	385.44
III	129.58	562.47	109.14	384.35
IV	129.58	562.47	109.14	384.35

Class Table for 2 or 3 lanes (not future 4 lane & not one-way street)	
ADT	Class
0 - 749	IV
750 - 2000	III
>2000	II

	Design Lane Distribution Factors For Structural Design Traffic (Fig. 54-2.B)					
	Rural			Urban		
Number of Lanes	P	S	M	P	S	M
1 Lane Ramp	100%	100%	100%	100%	100%	100%
2 or 3	50%	50%	50%	50%	50%	50%
4	32%	45%	45%	32%	45%	45%
6 or more	20%	40%	40%	8%	37%	37%

BDE 5401 Template (Rev. 10/05/2012) Printed: 11/07/2013

LIFE-CYCLE COST ANALYSIS: NEW CONSTRUCTION / RECONSTRUCTION

FULL-DEPTH HMA PAVEMENT

Standard Design

ROUTE	Job Route
SECTION	Job Section
COUNTY	Job County
LOCATION	Job Location

FACILITY TYPE: NON-INTERSTATE

PROJECT LENGTH			1000	FT ==>	0.19 Miles
# OF CENTERLINES			2	CL	
# OF LANES			4	LANES	
# OF EDGES			4	EP	
LANE WIDTH - AVERAGE			12	FT	
SHOULDER WIDTH	HMA	Inside	6	FT	
	HMA	Outside	10	FT	

PAVEMENT THICKNESS (FLEXIBLE)	12.00 IN	17.00 IN MAX	
SHOULDER THICKNESS	12.00 IN	HMA_SD	Standard Design
POLICY OVERLAY THICKNESS	2.25 IN		

FLEX PAVEMENT TRAFFIC FACTORS	MINIMUM	ACTUAL	USE
	7.11	1.00	7.11

Read Me!

HMA COST PER TON	UNIT PRICE
HMA SURFACE	$95.00 / TON
HMA TOP BINDER	$90.00 / TON
HMA LOWER BINDER	$85.00 / TON
HMA BINDER (LEVELING)	$95.00 / TON
HMA SHOULDER	$85.00 / TON

INITIAL COSTS

ITEM	THICKNESS	100% QUANTITY	UNIT		UNIT PRICE	COST
HMA PAVEMENT (FULL-DEPTH)	(12.00")	5,333	SQ YD		$61.27 / SQ YD	$326,781 ~
HMA SURFACE COURSE	(2.00")	5,333	SQ YD		$10.71 / SQ YD	$0
HMA TOP BINDER COURSE	(2.25")	5,333	SQ YD		$11.59 / SQ YD	$0
HMA LOWER BINDER COURSE	(7.75")	5,333	SQ YD		$38.97 / SQ YD	$0
HMA SHOULDER	(12.00")	3,556	SQ YD	*	$41.73 / SQ YD	$148,373 ~
CURB & GUTTER		0	LIN FT		$30.00 / LIN FT	$0
SUBBASE GRAN MATL TY C (TONS)		0	TONS		$25.00 / TON	$0
IMPROVED SUBGRADE:	Aggregate	5,333	SQ YD	*	$10.00 / SQ YD	$53,330
Reserved For User Supplied Item		0	UNITS		$0.00 / UNITS	$0
Reserved For User Supplied Item		0	UNITS		$0.00 / UNITS	$0
PAVEMENT REMOVAL		5,333	SQ YD		$0.00 / SQ YD	$0
SHOULDER REMOVAL		3,556	SQ YD		$0.00 / SQ YD	$0

Note: * Denotes User Supplied Quantity

FLEXIBLE CONSTRUCTION INITIAL COST	$528,484
FLEXIBLE CONSTRUCTION ANNUAL COST PER MILE	$113,807

MAINTENANCE COSTS:

ITEM		THICKNESS	MATERIAL	T	UNIT COST
ROUTINE MAINTENANCE ACTIVITY					$0.00 LANE-MILE / YEAR
HMA OVERLAY PVMT SURF		(2.00")	Surface Mix	2.00	$10.00 / SQ YD
HMA OVERLAY PVMT		(2.25")		2.25	$11.25 / SQ YD
HMA SURFACE MIX		(1.50")	Surface Mix	1.50	$7.50 / SQ YD
HMA BINDER MIX		(0.75")	eling Binder Mix	0.75	$3.75 / SQ YD
HMA OVERLAY SHLD	(Year 30)	(2.25")	Shoulder Mix	2.25	$11.25 / SQ YD
HMA OVERLAY SHLD		(2.00")	Shoulder Mix	2.00	$10.00 / SQ YD
MILLING (2.00 IN)				2.00	$2.50 / SQ YD
PARTIAL DEPTH PVMT PATCH		(Mill & Fill Surf)	Surface Mix	2.00	$90.83 / SQ YD
PARTIAL DEPTH SHLD PATCH		(Mill & Fill Surf)	Shoulder Mix	2.00	$89.71 / SQ YD
PARTIAL DEPTH PVMT PATCH		(Mill & Fill +2.00 ")	Leveling Binder Mix	2.00	$90.83 / SQ YD
PARTIAL DEPTH SHLD PATCH		(Mill & Fill +2.00 ")	Shoulder Mix	2.00	$89.71 / SQ YD
LONGITUDINAL SHOULDER JOINT ROUT & SEAL					$2.00 / LIN FT
CENTERLINE JOINT ROUT & SEAL					$2.00 / LIN FT
RANDOM / THERMAL CRACK ROUT & SEAL		(100% Rehab = 110.00' / Station / Lane)			$2.00 / LIN FT

FLEXIBLE TOTAL LIFE-CYCLE COST	$717,252
FLEXIBLE TOTAL ANNUAL COST PER MILE	$154,457

HMA_SD

MAINTENANCE AND REHABILITATION ACTIVITY SCHEDULE

11/07/13

FULL-DEPTH HMA PAVEMENT
HMA OVERLAY OF RUBBLIZED PCC PAVEMENT
Figure 54-7.C
STANDARD DESIGN

MAINTENANCE COSTS:	ITEM	%	QUANTITY	UNIT	UNIT COST		COST	PRESENT WORTH
YEAR 5								
	LONG SHLD JT R&S	100.00%	4,000	LIN FT	$2.00		$8,000	
	CNTR LINE JOINT R&S	100.00%	2,000	LIN FT	$2.00		$4,000	
	RNDM / THRM CRACK R&S	50.00%	2,200	LIN FT	$2.00		$4,400	
	PD PVMT PATCH M&F SURF	0.10%	5	SQ YD	$90.83		$454	
	PWFn =	0.8626		PW =	0.8626	X	$16,854	$14,538
YEAR 10								
	LONG SHLD JT R&S	100.00%	4,000	LIN FT	$2.00		$8,000	
	CNTR LINE JOINT R&S	100.00%	2,000	LIN FT	$2.00		$4,000	
	RNDM / THRM CRACK R&S	50.00%	2,200	LIN FT	$2.00		$4,400	
	PD PVMT PATCH M&F SURF	0.50%	27	SQ YD	$90.83		$2,452	
	PWFn =	0.7441		PW =	0.7441	X	$18,852	$14,028
YEAR 15								
	MILL PVMT & SHLD 2.00"	100.00%	8,889	SQ YD	$2.50		$22,223	
	PD PVMT PATCH M&F ADD'L 2.00"	1.00%	53	SQ YD	$90.83		$4,814	
	HMA OVERLAY PVMT 2.00"	100.00%	5,333	SQ YD	$10.00		$53,333	
	HMA OVERLAY SHLD 2.00 "	100.00%	3,556	SQ YD	$10.00		$35,556	
	PWFn =	0.6419		PW =	0.6419	X	$115,926	$74,408
YEAR 20								
	LONG SHLD JT R&S	100.00%	4,000	LIN FT	$2.00		$8,000	
	CNTR LINE JOINT R&S	100.00%	2,000	LIN FT	$2.00		$4,000	
	RNDM / THRM CRACK R&S	50.00%	2,200	LIN FT	$2.00		$4,400	
	PD PVMT PATCH M&F SURF	0.10%	5	SQ YD	$90.83		$454	
	PWFn =	0.5537		PW =	0.5537	X	$16,854	$9,332
YEAR 25								
	LONG SHLD JT R&S	100.00%	4,000	LIN FT	$2.00		$8,000	
	CNTR LINE JOINT R&S	100.00%	2,000	LIN FT	$2.00		$4,000	
	RNDM / THRM CRACK R&S	50.00%	2,200	LIN FT	$2.00		$4,400	
	PD PVMT PATCH M&F SURF	0.50%	27	SQ YD	$90.83		$2,452	
	PWFn =	0.4776		PW =	0.4776	X	$18,852	$9,004
HMA_SD								
YEAR 30	NON-INTERSTATE							
	MILL PVMT & SHLD 2.00"	100.00%	8,889	SQ YD	$2.50		$22,223	
	PD PVMT PATCH M&F ADD'L 2.00"	2.00%	107	SQ YD	$90.83		$9,719	
	PD SHLD PATCH M&F ADD'L 2.00"	1.00%	36	SQ YD	$89.71		$3,230	
	HMA OVERLAY PVMT 2.25 "	100.00%	5,333	SQ YD	$11.25		$60,000	
	HMA OVERLAY SHLD 2.25 "	100.00%	3,556	SQ YD	$11.25		$40,000	
	PWFn =	0.4120		PW =	0.4120	X	$135,172	$55,689
YEAR 35								
	LONG SHLD JT R&S	100.00%	4,000	LIN FT	$2.00		$8,000	
	CNTR LINE JOINT R&S	100.00%	2,000	LIN FT	$2.00		$4,000	
	RNDM / THRM CRACK R&S	50.00%	2,200	LIN FT	$2.00		$4,400	
	PD PVMT PATCH M&F SURF	0.10%	5	SQ YD	$90.83		$454	
	PWFn =	0.3554		PW =	0.3554	X	$16,854	$5,990
YEAR 40								
	LONG SHLD JT R&S	100.00%	4,000	LIN FT	$2.00		$8,000	
	CNTR LINE JOINT R&S	100.00%	2,000	LIN FT	$2.00		$4,000	
	RNDM / THRM CRACK R&S	50.00%	2,200	LIN FT	$2.00		$4,400	
	PD PVMT PATCH M&F SURF	0.50%	27	SQ YD	$90.83		$2,452	
	PWFn =	0.3066		PW =	0.3066	X	$18,852	$5,779
								$188,768
	ROUTINE MAINTENANCE ACTIVITY		0.76	Lane Miles	0.00		$0	$0
					MAINTENANCE LIFE-CYCLE COST			$188,768
45	YEAR LIFE CYCLE	CRFn = 0.0407852			MAINTENANCE ANNUAL COST PER MILE			$40,650

PCC PAVEMENT

JPCP

ROUTE			**Job Route**		
SECTION			**Job Section**		
COUNTY			**Job County**		
LOCATION			**Job Location**		
FACILITY TYPE			**NON-INTERSTATE**		
PROJECT LENGTH			**1000** FT	= = >	0.19 Miles
# OF CENTERLINES			**2** CL		
# OF LANES			**4** LANES		
# OF EDGES			**4** EP		
LANE WIDTH - AVERAGE			**12** FT		
SHOULDER WIDTH	PCC	Inside	**6** FT		
	PCC	Outside	**10** FT		

PAVEMENT THICKNESS (RIGID)	**JPCP**	**10.00** IN	TIED SHLD
SHOULDER THICKNESS		**10.00** IN	
POLICY OVERLAY THICKNESS		**2.50** IN	

RIGID PAVEMENT TRAFFIC FACTORS	MINIMUM	ACTUAL	USE
	10.05	**1.00**	**10.05**
Worksheet Construction Type is New Construction		**The Pavement Type is**	**JPCP**

INITIAL COSTS

ITEM	THICKNESS	100% QUANTITY	UNIT		UNIT PRICE		COST
JPC PAVEMENT	(10.00")	5,333	SQ YD		**$50.00**	/ SQ YD	$266,650
PAVEMENT REINFORCEMENT		0	SQ YD		**$0.00**	/ SQ YD	$0
STABILIZED SUBBASE	(4.50")	6,000	SQ YD		**$15.00**	/ SQ YD	$90,000
PCC SHOULDERS	(10.00" to 10.00")	3,556	SQ YD		**$45.00**	/ SQ YD	$160,020
CURB & GUTTER		0	LIN FT		**$30.00**	/ LIN FT	$0
SUBBASE GRAN MATL TY C	(~ 4.23")	0	TONS	*	**$25.00**	/ TON	$0
IMPROVED SUBGRADE:	Aggregate	5,333	SQ YD	*	**$10.00**	/ SQ YD	$53,330
Reserved For User Supplied Item		0	**UNITS**		**$0.00**	/ UNITS	$0
Reserved For User Supplied Item		0	**UNITS**		**$0.00**	/ UNITS	$0
PAVEMENT REMOVAL		5,333	SQ YD		**$0.00**	/ SQ YD	$0
SHOULDER REMOVAL		3,556	SQ YD		**$0.00**	/ SQ YD	$0

Note: * Denotes User Supplied Quantity

RIGID CONSTRUCTION INITIAL COST	$570,000
RIGID CONSTRUCTION ANNUAL COST PER MILE	$122,747

MAINTENANCE COSTS:

ITEM	THICKNESS	MATERIAL		UNIT COST	
ROUTINE MAINTENANCE ACTIVITY				**$0.00**	/ LANE-MILE / YEAR
HMA POLICY OVERLAY	(2.50")				
HMA POLICY OVERLAY PVMT	(2.50")			**$12.50**	/ SQ YD
HMA SURFACE MIX	(1.50")	Surface Mix		**$7.50**	/ SQ YD
HMA BINDER MIX	(1.00")	aling Binder Mix		**$5.00**	/ SQ YD
HMA POLICY OVERLAY SHLD	(2.50")	Shoulder Mix		**$12.50**	/ SQ YD
CLASS A PAVEMENT PATCHING				**$170.00**	/ SQ YD
CLASS B PAVEMENT PATCHING				**$130.00**	/ SQ YD
CLASS C SHOULDER PATCHING				**$110.00**	/ SQ YD
PARTIAL DEPTH PVMT PATCH (Mill & Fill HMA Surf)		Surface Mix		**$88.17**	/ SQ YD
PARTIAL DEPTH PVMT PATCH (Mill & Fill HMA 2.50")		Surface Mix		**$93.49**	/ SQ YD
LONGITUDINAL SHOULDER JOINT ROUT & SEAL				**$2.00**	/ LIN FT
CENTERLINE JOINT ROUT & SEAL				**$2.00**	/ LIN FT
REFLECTIVE TRANSVERSE CRACK ROUT & SEAL				**$2.00**	/ LIN FT
RANDOM CRACK ROUT & SEAL	(100% Rehab = 100.00' / Station / Lane)			**$2.00**	/ LIN FT

RIGID TOTAL LIFE-CYCLE COST	$672,960
RIGID TOTAL ANNUAL COST PER MILE	$144,919

MAINTENANCE AND REHABILITATION ACTIVITY SCHEDULE 11/07/13

JOINTED PLAIN CONCRETE PAVEMENT
UNBONDED JOINTED PLAIN CONCRETE OVERLAY
Figure 54-7.A

MAINTENANCE COSTS:	ITEM	%	QUANTITY	UNIT	UNIT COST		COST	PRESENT WORTH
YEAR 10								
	PAVEMENT PATCH CLASS B	0.10%	5	SQ YD	$130.00		$650	
	PWFn =	0.7441		PW =	0.7441	X	$650	$484
YEAR 15								
	PAVEMENT PATCH CLASS B	0.20%	11	SQ YD	$130.00		$1,430	
	PWFn =	0.6419		PW =	0.6419	X	$1,430	$918
YEAR 20								
	PAVEMENT PATCH CLASS B	2.00%	107	SQ YD	$130.00		$13,910	
	SHOULDER PATCH CLASS C	0.50%	18	SQ YD	$110.00		$1,980	
	LONGITUDINAL SHLD JT R&S	100.00%	4,000	LIN FT	$2.00		$8,000	
	CENTERLINE JT R&S	100.00%	2,000	LIN FT	$2.00		$4,000	
	PWFn =	0.5537		PW =	0.5537	X	$27,890	$15,442
YEAR 25								
	PAVEMENT PATCH CLASS B	3.00%	160	SQ YD	$130.00		$20,800	
	SHOULDER PATCH CLASS C	1.00%	36	SQ YD	$110.00		$3,960	
	PWFn =	0.4776		PW =	0.4776	X	$24,760	$11,826
YEAR 30	NON-INTERSTATE							
	PAVEMENT PATCH CLASS B	4.00%	213	SQ YD	$130.00		$27,690	
	SHOULDER PATCH CLASS C	1.50%	53	SQ YD	$110.00		$5,830	
	HMA POLICY OVERLAY 2.5" (PVMT)	100.00%	5,333	SQ YD	$12.50		$66,667	
	HMA POLICY OVERLAY 2.5" (SHLD)	100.00%	3,556	SQ YD	$12.50		$44,445	
	PWFn =	0.4120		PW =	0.4120	X	$144,632	$59,586
YEAR 35	NON-INTERSTATE							
	LONGITUDINAL SHLD JT R&S	100.00%	4,000	LIN FT	$2.00		$8,000	
	CENTERLINE JT R&S	100.00%	2,000	LIN FT	$2.00		$4,000	
	RANDOM CRACK R&S	50.00%	2,000	LIN FT	$2.00		$4,000	
	REFLECTIVE TRANSVERSE CRACK R&S	40.00%	1,286	LIN FT	$2.00		$2,572	
	PD PVMT PATCH M&F HMA 2.50"	0.10%	5	SQ YD	$93.49		$467	
	PWFn =	0.3554		PW =	0.3554	X	$19,039	$6,766
YEAR 40	NON-INTERSTATE							
	PAVEMENT PATCH CLASS B	0.50%	27	SQ YD	$130.00		$3,510	
	LONGITUDINAL SHLD JT R&S	100.00%	4,000	LIN FT	$2.00		$8,000	
	CENTERLINE JT R&S	100.00%	2,000	LIN FT	$2.00		$4,000	
	REFLECTIVE TRANSVERSE CRACK R&S	60.00%	1,930	LIN FT	$2.00		$3,860	
	RANDOM CRACK R&S	50.00%	2,000	LIN FT	$2.00		$4,000	
	PD PVMT PATCH M&F HMA 2.50"	0.50%	27	SQ YD	$93.49		$2,524	
	PWFn =	0.3066		PW =	0.3066	X	$25,894	$7,938
								$102,960
	ROUTINE MAINTENANCE ACTIVITY		0.76	Lane Miles	$0.00		$0	$0
					MAINTENANCE LIFE-CYCLE COST			$102,960
45	YEAR LIFE CYCLE	CRFn = 0.0407852			MAINTENANCE ANNUAL COST PER MILE			$22,172

LIFE-CYCLE COST ANALYSIS: NEW DESIGN

Calculated / Revised : **10/4/12 3:26 PM**

			JPCP	HMA
CONSTRUCTION	INITIAL COST	PRESENT WORTH	$570,000	$528,484
		ANNUAL COST PER MILE	$122,747	$113,807
MAINTENANCE	LIFE-CYCLE COST	PRESENT WORTH	$102,960	$188,768
		ANNUAL COST PER MILE	$22,172	$40,650
TOTAL	LIFE-CYCLE COST	PRESENT WORTH	$672,960	$717,252
		ANNUAL COST PER MILE	$144,919	$154,457

LIFE-CYCLE COST ANALYSIS: FINAL SUMMARY

LOWEST COST OPTION	==========>	**JPCP**	**$144,919**	
OTHER OPTIONS (LOWEST TO HIGHEST):	TYPE / PERCENTAGE	**HMA**	**$154,457**	6.6%

P:\Pavement Design Stuff\D-1\IL 47 at O'Brien & Thayer Roads\[IL 47 At Thayer Rd IDOT Mechanistic Pavement Design with LCCA_10-11-12.xlsm]LifeCycleCost

First Cost Analysis of Widening Project

Date:
Quantities by:
Unit prices by:

Checked by:
Checked by:
Net Length

Route
Section
County
Project
Contract

Mechanistic Flexible

Area (Sq. Yd.)	Height (inches)	Weight (Tons)	Material		Unit Cost	Total	ITEM #
		0	HMA **Surface** Course, MIX "D" N50	@		$0.00	40603335
1255	1.5	105	HMA **Surface** Course, MIX "D" N70	@	$62	$6,536.04	40603340
		0	Poly HMA **Surface** Course, MIX "F" N90	@		$0.00	40603595
		0	Poly HMA **Surface** Course, SMA N80	@		$0.00	40603153
1255	1	70	Poly Leveling Binder, IL-4.75, N50	@	$52	$3,654.56	
1255	7	492	HMA **Binder** course, IL-19, N70	@	$60	$29,517.60	40603085
		0	HMA **Binder** course, IL-19, N90	@		$0.00	40603090
		0	Poly HMA **Binder** course, IL-19, N90	@		$0.00	40603240
		0	HMA **Binder** course, SMA, N80	@		$0.00	40603148
	NA	NA	12" Aggregate Subgrade	@		$0.00	30300112
			Total			**$39,708.20**	

Modified AASHTO

Area (Sq. Yd.)	Height (inches)	Weight (Tons)	Material		Unit Cost	Total	ITEM #
		0	HMA **Surface** Course, MIX "D" N50	@		$0.00	40603335
1255	1.5	105	HMA **Surface** Course, MIX "D" N70	@	$62	$6,536.04	40603340
		0	Poly HMA **Surface** Course, MIX "F" N90	@		$0.00	40603595
		0	Poly HMA **Surface** Course, SMA N80	@		$0.00	40603153
1255	1	70	Poly Leveling Binder, IL-4.75, N50	@	$52	$3,654.56	
1255	8	562	HMA **Binder** course, IL-19, N70	@	$60	$33,734.40	40603085
		0	HMA **Binder** course, IL-19, N90	@		$0.00	40603090
		0	Poly HMA **Binder** course, IL-19, N90	@		$0.00	40603240
		0	HMA **Binder** course, SMA, N80	@		$0.00	40603148
	NA	NA	12" Aggregate Subgrade	@		$0.00	30300112
			Total			**$43,925.00**	

Composite

Area (Sq. Yd.)	Height (inches)	Weight (Tons)	Material		Unit Cost	Total	ITEM #
		0	HMA **Surface** Course, MIX "D" N50	@		$0.00	40603335
1255	1.5	105	HMA **Surface** Course, MIX "D" N70	@	$62	$6,536.04	40603340
1255	1	70	Poly Leveling Binder, IL-4.75, N50	@	$52	$3,654.56	40603595
		0	Poly HMA **Surface** Course, SMA N80	@		$0.00	40603153
1255	11	NA	PCC Base Course	@	$75	$94,125.00	35300410
	NA	NA	12" Aggregate Subgrade	@		$0.00	30300112
			Total			**$104,315.60**	